A Comparison of Chief Complaints and Emergency Department Reports for Identifying Patients with Acute Lower Respiratory Syndrome

Wendy Chapman, John Dowling, Gregory F Cooper, Milos Hauskrecht, Michal Valko

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Wendy W. Chapman, PhD[1], John N. Dowling, MD, MS[1], Gregory F. Cooper, MD, PhD[1], Milos Hauskrecht, PhD[2], Michal Valko, MSc [2]

University of Pittsburgh Departments of Biomedical Informatics[1] and Computer Science[2]

INTRODUCTION

Automated syndromic surveillance systems often classify patients into syndromic categories based on free-text chief complaints. Chief complaints (CC) demonstrate low to moderate sensitivity in identifying syndromic cases. Emergency Department (ED) reports promise more detailed clinical information that may increase sensitivity of detection.

OBJECTIVE

Compare classification of patients based on chief complaints against classification from clinical data described in ED reports for identifying patients with an acute lower respiratory syndrome.

METHODS

As shown in Figure 1, 272 patients were automatically classified based on chief complaints and on 55 clinical features related to lower respiratory illness (e.g., cough, shortness of breath, pneumonia on x-ray, oxygen desaturation, CHF, etc.). We compared Chief Complaint Classification by classifiers CoCo and MPLUS against ED Classification using a Random Forests Classifier. Gold Standard Classification comprised majority vote of three physicians reading ED reports. We also compared individual physician classifications against Gold Standard Classification for physicians reading (a) chief complaints, (b) full-text ED reports, and (c) 55 manually abstracted clinical features. We calculated sensitivity and specificity for human and automated classifiers by randomly splitting the 272 cases into 70% train and 30% test sets and averaging performance over 40 splits.

RESULTS

Figure 2 plots the true positive rate (TPR) and false positive rate (FPR) of human and automated classifications. ED Classification with the Random Forest Classifier (curve) performed similarly to three individual physicians reading ED reports (upper three diamonds) and three physicians reading 55 abstracted clinical features (lower three diamonds). ED Classification dominated CC Classification by a physician (□), CoCo (△), and MPLUS (○).

CONCLUSIONS

ED Classification showed higher sensitivity and specificity than CC Classification when classifying patients based on acute lower respiratory syndrome. The Random Forest Classifier performed similarly to physicians but used manually abstracted clinical features. Future work will involve automatically abstracting the 55 features from ED reports using natural language processing.

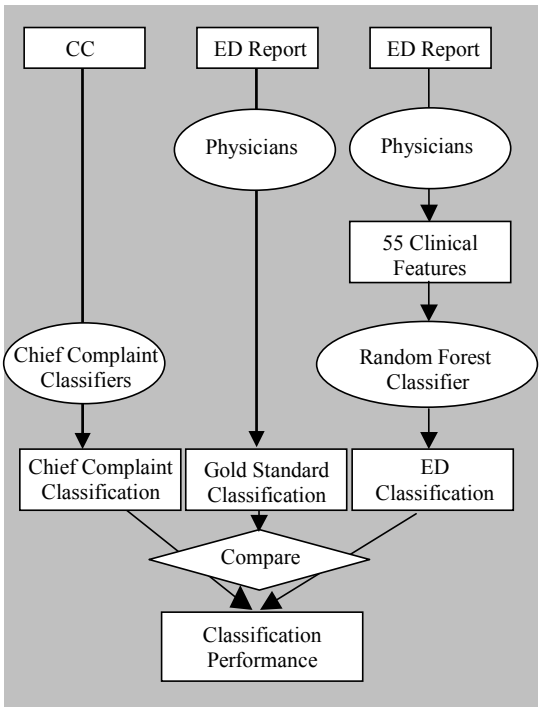

Figure 1. Experiment for comparing classification from chief complaints against classification from ED reports for 272 patients

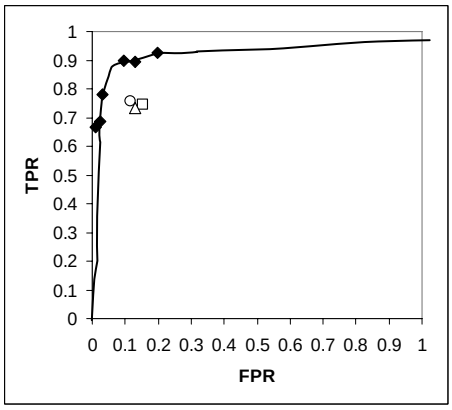

Figure 2. ROC curve for ED Classification using Random Forests. The curve intersects the majority of physician classifications based on the ED report (black diamonds) and dominates classification from CC's (white shapes).